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## SOIL TESTING AS A GUIDE TO SOUND SOIL MANAGEMENT

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The first annual report of the Connecticut Agricultural Experiment Station, issued fifty-eight years ago, gave considerable attention to the problem of diagnosing the special fertilizer needs of the individual soil. The method of field fertilizer tests by the farmer had just been introduced by Dr. W. O. Atwater who had learned the details of the practice in his studies in Germany. This report contains a quotation from Wolff, the great German agricultural chemist, (1875) as follows:

"It is of the greatest importance to the farmer to find out which of the more important ingredients of plant food his soil, in actual condition, fails to supply in sufficient quantity for the production of the largest possible crops, and which, when directly added, would therefore exercise an especially favorable and profitable influence."

The above report also contains this comment:

"One of the main results of the vast amount of work done in field experiments with fertilizers is the clear demonstration that soils vary greatly in their capabilities of supplying food to crops, that different ingredients are deficient in different soils, and that the results of any given experiment are in the main applicable only to the particular kind of soil on which it is made."

Farm fertilizer tests advocated by Atwater were tried out for a few years in several states, but it was soon found that this method of studying the fertilizer needs was not only expensive, requiring much time and special care on the part of the farmer in measuring the results on the various treatments, but also rather unreliable, due to the variations in soil conditions from plot to plot. Data for some years was questionable on account of unfavorable seasonal conditions.

In the main, soil management practices have largely been on an

empirical basis. The individual farmer, through years of experience, has learned that certain practices give profitable increases in yield. From time to time many thoughtful farmers have sought some means of finding out in advance whether or not the treatment used was best fitted to meet the special requirements of his soil.

Since fertilizers and lime are chemical materials, it appears logical that chemical analysis should show the needs of the soil. Methods of chemical soil analysis which were commonly used during the latter part of the 19th and the first quarter of the 20th centuries were chiefly designed to show the total composition of the soil with respect to the various elements related to plant growth. Though this type of examination may reveal the potential fertility of the soil, it gives little clew to the concentrations of the plant nutrients which exist in sufficiently active forms to affect plant growth. A full appreciation of the dynamic status of the soil necessarily awaited the development of our present knowledge of the activities of soil micro-organisms, the effect of soil colloids in regulating the interaction of the basic constituents of the soil and the seasonal ebb and flow of soluble salts as affected by the leaching action of downward percolating soil waters and concentration during dry periods.

Chiefly as a result of the above limitations, complete or strong acid soluble chemical analysis produced disappointing results as a guide to soil management practices. Dr. E. H. Jenkins, former director of the Connecticut Agricultural Experiment Station, wisely cautioned the farmers of his state against the use of chemical analysis as a practical proposition.

For a number of years it has been possible, by means of chemical methods, to arrive at a fair idea as to the lime needs of the soil. The earlier procedures for determining lime requirement were somewhat long and expensive and did not reach any large number of farmers. Beginning about fifteen years ago, much simpler means of estimating the degree of acidity became available. The extension service, through its agronomists and county agents, was in a position to determine this factor on a sample of soil from a given field within a few moments' time, whereas before it required days of laboratory work to obtain this picture for only a small number of soils. The simplicity and practical value of the soil acidity test stimulated research workers in attempts to do something of the same kind for other soil conditions which affect fertilizer practice. Rapid strides in the fundamentals of soil chemistry gave us new concepts and afforded suitable tools to attack this problem.

The first simple determination of promise was an available phosphorus test. At several different Experiment Stations relatively simple methods have been worked out which give results in good agreement with known response of soils to phosphorus fertilization. However, it was soon learned that the interpretation of this test depended to a large degree upon some knowledge of the status of the soil with respect to other factors, such as soil acidity, activity of aluminum, or readily available calcium. The phosphorus test, used alone, has been most widely popular in the middle-west, where this is the element most commonly needed as a fertilizer and where other factors affecting phosphorous availability are comparatively uniform.

The dynamic state of the soil is most strikingly illustrated with respect to the concentration of nitrate nitrogen in the soil. While the total nitrogen supply in an acre to plow depth ranges from 2,000 to 10,000 pounds, only that portion which has been converted into nitrate nitrogen is of practical significance in its effect upon plant growth. Unless applied directly as nitrates in the fertilizer this constituent is liberated through the activity of certain species of soil micro-organisms. In the nitrate form nitrogen is rapidly taken up by the roots of growing plants and is also completely water soluble, subject to removal downward through leaching. Regardless of the concentration during the previous season, nitrates are thus at a very low level in early spring. During the early summer months the nitrates attain a maximum which is rapidly depleted if growing crops occupy the land. Laboratory methods for determining nitrate nitrogen have been used for many years and the author developed a method for the rapid estimate of this constituent by simple soil testing which has been a valuable help in showing a level of available nitrogen which falls sufficiently low to justify the immediate application of some quickly available form of this element.

Before arriving at the final nitrate stage, organic sources of nitrogen, either native in the soil or applied in the fertilizer, pass through the ammonia stage. Many fertilizers supply nitrogen directly in the form of ammonium salts. Hence, it is of some value to be able to estimate the concentration of this form of nitrogen. A very simple test is applicable in this connection and is a necessary part of any comprehensive system of soil testing.

Practical experiences of many farmers, particularly in the production of vegetable crops, potatoes, tobacco, and alfalfa have demonstrated the value of the use of potash as a fertilizer. Pot experiments, conducted by the author on a large number of soils, have shown that wide variations exist with respect to the availability of this element in

different soils. At the present time several comparatively reliable schemes for revealing the available potassium in the soil have been developed. The method used at the Connecticut Agricultural Experiment Station for the past two years has consistently predicted the success or failure of potash fertilization on the soils used in our experiments.

In spite of the great value of soil acidity testing by means of pH determination, it has been generally recognized that there are great differences in the actual need for lime between soils of the same pH value. Two other factors closely related to soil acidity have much to do with this situation. Soils with a fairly high content of exchangeable calcium, usually associated with a large amount of organic matter or a heavier texture, often produce good crops of red clover without liming, even though a considerable degree of acidity exists. On the other hand, the high concentrations of active aluminum which are characteristic of many strongly acid soils are especially injurious and accentuate the need for lime. The author has developed methods for estimating these forms of calcium and aluminum which are well suited to simple soil testing technique. Their use gives a much clearer picture of the acid status of the soil than is possible through the usual pH or "lime requirement" tests.

During the past few years a number of cases have been discovered in the northeastern states which show that magnesium may be an actual deficiency on some soils. Hence, much attention is now being devoted to this element, particularly in potato, vegetable, and tobacco fertilization. Field trials show great variations in the response of the potato crop in different localities to magnesium, and this is probably true of many other crops. An especially satisfactory and simple method for the determination of the active magnesium in the soil is now available and enables us to determine when this element has any possibilities in soil improvement practices.

Manganese is another element which has recently been receiving a considerable amount of attention in some sections. Although existing in rather small quantities in all soils, it is capable of acting either as a plant stimulant or a plant poison, depending upon its concentration in soluble form within the soil. Occasionally, under conditions of strong acidity, an injuriously high amount of active manganese is present. An interesting case of this sort came to our attention a few weeks ago. A cabbage field grew poorly and showed very peculiar leaf characteristics. Soil tests for manganese showed a very high concentration and since that time results of greenhouse trials have

confirmed our diagnosis as to the source of trouble. On the other hand, striking response to light applications of manganese on soils which had been limed practically to the neutral point at the Rhode Island Experiment Station have encouraged many to give a large, and perhaps undue, amount of attention to this element in fertilizer practice. Results of our soil tests show that manganese deficiency is a rare condition in Connecticut and even on well-limed soils a positive manganese test insures against any need for this element, since it is only needed in very small quantities when needed at all.

Under the author's direction a system of soil testing is now being used at the Connecticut Agricultural Experiment Station, which includes determinations of all of the constituents which have been here discussed. Since all tests may be made from a single soil extract, the procedure is very rapid. This has enabled us to greatly expand our facilities for soil testing service. The work along this line is being done at three important centers within the state. The Extension Service of the Connecticut State College now takes care of most of the demands for soil testing service for those engaged in dairy farming. Tobacco soils are usually studied by the sub-station at Windsor, while at the New Haven station we have served chiefly those interested in specialized problems, such as vegetable growing, fruit raising, landscape gardening, and turf culture. However, at any of these soil testing centers, service is offered to all who are interested.

A certain amount of soil testing work is being done by the county agents, although I believe none of them offer any comprehensive scheme of testing for the several constituents related to crop production. No doubt this is due to the unusual demands upon their time which have been entailed by some of the agricultural adjustment activities. It is hoped that in the future more service may be available through the local Farm Bureaus.

Frequently farmers ask us if it is practicable for them to obtain some sort of soil testing kit which would enable them to test their own soils. There are a few very simple outfits on the market for determining soil acidity to a sufficiently accurate degree for practical purposes and which involve no special difficulties in manipulation. Test kits for phosphorus and potassium are available commercially but require a considerable amount of precision in manipulation and some appreciation for the errors which are apt to occur in chemical methods. They are best used by some one who does the work from day to day on a large number of samples and are not likely to give reliable results in the hands of an inexperienced person or when only a few samples

are to be tested by the person operating them. Hence, we have generally advised against the practice of soil testing by the individual farmer and believe that it is much more desirable that this work be done by some one trained in both the operation and the interpretation of the tests.

Simultaneously with the working out of soil testing methods there have been schemes proposed whereby simple chemical field tests of the plant material itself may be used to indicate whether or not a given element is insufficiently supplied to the plant by the soil. Negative tests for nitrate nitrogen in the younger leaves are considered as indicating a depletion of the available nitrogen in the soil. Low phosphorus tests in plants usually go hand-in-hand with low phosphorus tests in the soil. Plant tests with respect to potassium are especially promising, since this element remains in soluble form within the green plant, and is capable of accumulating in considerable concentration if the soil is rich in readily available potash.

The plant tests are being widely used in one of the Corn Belt states, but have not been fully studied under eastern conditions. At best they can only give the explanation after the crop has suffered from lack of an element of fertility, or after the farmer has used quantities of fertilizer which were not needed.

Soil testing, by means of rapid and simple schemes, is a very new development and we can expect much progress to be made in this line within the next few years. It appears desirable that as many as possible of the soil constituents which are related to plant growth should be thus estimated in order to give us the clearest possible picture of the conditions of the soil which may affect crop growth. However, a knowledge of the chemical status of the soil, even though quite accurately obtained through the medium of soil testing, is but a part of the picture. The most chemically fertile soil cannot produce good crops under conditions of poor drainage, improper methods of cultivation, excessive drouth, severe weed competition, or the ravages of insects and fungous diseases. Any one of these factors may be sufficient to mask entirely the effect of properly balancing the soil from a nutritive standpoint. A number of years ago in a circular sent out to farmers regarding the chemical analysis of soils Dr. Jenkins stated as follows:

"Experience teaches that the mechanical condition of the soil, its water-supply and water-holding capacity, its drainage, temperature and aeration more largely affect the success of a crop than the chemicals or fertilizers added at planting time."



Soil testing methods are exceedingly useful tools in the more intelligent use of lime and fertilizers. However, it may take several years for us to calibrate them sufficiently accurately to use them as the sole guide in drawing up the best fertilizer formula, and it is not at all certain that this will ever be either possible or desirable. In the meantime we can best use them as valuable indicators of soil conditions which cannot be revealed in other ways, to be interpreted in the light of all other known facts in regard to past treatment and crop conditions, the physical characteristics of the soil and the specific requirements of the crops to be grown in the future.

## FERTILIZER PLACEMENT STUDIES WITH POTATOES IN 1933

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### INTRODUCTION

Fertilizer placement studies to determine the best method of applying fertilizer for potatoes were started in 1931 in New Jersey, Michigan, and Ohio. Reports <sup>(a)</sup> have been issued covering the results obtained. In 1932 the placement studies were expanded to take in important soil types in Maine and Virginia. Reports <sup>(b)</sup> were made

(a) Martin, W. H. and Brown, B. E. (1932). Fertilizer placement studies with the potato. Proceedings of the Eighteenth Annual Meeting of the Potato Association of America, pp. 77-114.

Progress report on cooperative fertilizer placement studies on potatoes in 1931. Report presented by B. E. Brown to the Joint Committee on Fertilizer Application in Chicago on November 18, 1931, for the cooperating agencies.

(b) Proceedings of the 8th Annual Meeting of the Joint Committee on Fertilizer Application. Reports covering the potato work were made as follows: (1) General Summary of Fertilizer Placement Results on Potatoes in Maine, Michigan, New Jersey, Ohio and Virginia in 1932, by B. E. Brown; (2) Results from Machine Placement of Fertilizer on Potatoes in New Jersey for 1932, by B. E. Brown and W. H. Martin; (3) Cooperative Placement Studies in Maine for 1932, by J. A. Chucks, Maine Agricultural Experiment Station; (4) Results from Machine Placement of Fertilizer on Potatoes in Ohio for 1932, by John Bushnell, Ohio Agricultural Experiment Station; (5) Fertilizer Placement Studies with Potatoes in Virginia for 1932, by W. O. Strong, Virginia Truck Experiment Station; and (6) Results from Machine Placement of Fertilizer on Potatoes in Michigan for 1932, by C. E. Millar, Michigan Agricultural Experiment Station. These same cooperators presented reports covering fertilizer placement studies made in 1933, at the Chicago meeting of the Joint Committee on Fertilizer Application on November 15, 1933. The Virginia report for 1933 was prepared by W. O. Strong and G. V. C. Houghland.

to the Joint Committee on Fertilizer Application at its Washington meeting on November 16, 1932, by the various cooperators in the five states, at which time a general summary of the experimental work was also presented.

The fertilizer placement studies conducted in 1933 were similar to those made in 1932. In addition to the work in Michigan on Montcalm sandy loam, an experiment was conducted on Mancelona gravelly sandy loam in the northern part of the state. This made a total of six field experiments on as many important soil types on which potatoes are produced commercially.

Growers in all of these sections use commercial fertilizer to produce the crop, the rate of application ranging from 300 to 600 pounds per acre in Michigan, 500 to 800 pounds in Ohio, and 1,500 to 2,000 pounds in Maine, New Jersey and Virginia. In every case, regardless of whether a low or high rate of application is involved, it is important that the fertilizer be used economically. This means not only the use of a well-balanced fertilizer with regard to nitrogen, phosphoric acid and potash, but also the right quantity per acre properly placed with reference to the potato seed piece. Improperly applied fertilizer is a poor investment yielding low returns as measured in terms of bushels or barrels of potatoes. This has been shown by the fertilizer placement work in the different states, which has indicated that certain methods of fertilizer placement gave decidedly poorer yields than did other methods.

#### FERTILIZER DISTRIBUTING EQUIPMENT

The primary reason for organizing an extensive fertilizer placement study with the potato was to obtain fundamental information which might serve as a basis for the development of improved fertilizer attachments for potato planters and for recommendations as to the most effective methods of applying fertilizers. The different makes of potato planters with fertilizer attachments on the market were designed in most cases to give different placements of the fertilizer with respect to the seed piece. That is, some machines placed the fertilizer in a band at each side of the row, while others placed it on the surface of the ground, mixed in the row, under the seed piece, and in other locations. Likewise, the manner in which the fertilizer was incorporated in the soil differed materially among the local practices of applying the fertilizer in a separate operation before planting. Information was



lacking on the relative effectiveness of these different methods of applying fertilizers.

The study of machine application of fertilizers for potatoes could have been conducted by either of two somewhat different methods. Several commercial machines giving different placements of the fertilizer might have been selected for a comparative study. This method would give results which might be of value at the moment for each machine as a complete unit. However, commercial machines are constantly undergoing some change in which case the results would doubtless have a limited application. Furthermore, it would be impossible to adjust all machines to give exactly the same spacing of the seed, depth of planting, amount of fertilizer, etc.

Another method, the one followed in these investigations, was to use one special machine having suitable attachments with which the various placements of the fertilizer could be accurately controlled and with which all other conditions could be maintained uniformly throughout the entire experiment. Thus, a direct comparison of the effects of various fertilizer placements would be possible.

A special combined planter and fertilizer distributor was developed by the Bureau of Agricultural Engineering particularly to meet the requirements of the fertilizer placement study. In order to use attachments satisfactorily to obtain the various fertilizer placements, a machine of the 4-wheel type somewhat longer than the usual potato planter was required.

The soil-working tools, including the fertilizer placement devices, planter shoe, and bedding disks, were mounted rigidly on a sub-frame to insure the same relative and continuous placement of the fertilizer along the row. As the sub-frame was raised or lowered, all points moved equal distances; that is, the soil-working tools remained in the same position with respect to one another. Thus when the sub-frame was raised or lowered to alter the depth of planting, the placement of the fertilizer with respect to the seed piece was not changed. Wide ranges of adjustment were provided on the sub-frame so that practically any desired attachment could be mounted in almost any position.

Among the conditions to be held uniform for every test at any particular location are the depth of planting and the width and height of the bed. It is essential that these conditions be the same for every placement of the fertilizer. When furrowing attachments for placing the fertilizer at various distances from the row or at different depths in the row are mounted at the front of the machine, a single adjustment

of the ordinary planter equipment will not insure the same depth of planting or size of bed for every treatment. In some tests a furrow is opened in front of the planter shoe, while in others the soil is not disturbed. In some instances soil may be thrown out to a point where it will not be reached by the bedding disks. In order to eliminate these variable conditions, an extra set of bedding disks was mounted at the rear of the fertilizer attachments, for the purpose of returning all disturbed soil to the row in front of the seed shoe. Thus, the seed shoe and the regular bedding disks operate under similar conditions for every test regardless of how the soil may have been disturbed in applying the fertilizer.

The attachment for placing the fertilizer under the seed was a special shovel to which wings were attached for insuring a definite width of the fertilizer band. A rolling coulter was mounted in front of the shovel to avoid as much as possible difficulty from green manure or other vegetable matter previously turned under. For mixing the fertilizer with the soil about the seed piece the fertilizer was first placed in a band by use of the special shovel mentioned above, then mixed with the soil by means of a second shovel with prongs attached. Fertilizer placements in a band at each of the row were accomplished by using two standard single-disk furrow openers with tubes mounted to insure delivery of the fertilizer to the bottom of the furrow.

A standard, assisted-feed type of potato planter was used. Two fertilizer hoppers of the revolving-cylinder type which discharged the fertilizer from the top of the hopper by means of a plunger were mounted at the front of the machine. This type of hopper is of particular advantage in a fertilizer placement experiment because the fertilizer can be delivered through one or more flexible tubes to practically any part of the machine. In addition, the amount of fertilizer passing through any tube can be regulated. The fertilizer is also distributed uniformly along the row, and the quantities applied per acre are determined positively by the travel of the hopper plunger which can be regulated by changing gears and sprockets. Details of the fertilizer hoppers have been described in previous reports <sup>(c)</sup> of the Department.

The experimental machine is capable of adjustment to meet the planting requirements of different potato areas. Adjustments were

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(c) Mehring, Arnow L. and Glenn A. Cumings, 1930. Factors affecting the mechanical application of fertilizers to the soil. Technical Bul. 182.

Cumings, G. A., A. L. Mehring, J. J. Skinner and W. H. Sachs. Mechanical application of fertilizers to cotton in South Carolina, 1931. U. S. D. A. Circ. No. 264.

made at each location for the depth of planting, spacing of seed, and type of bed commonly used in the locality.

### FERTILIZER PLACEMENT WORK IN 1933

#### *Studies with ordinary strength fertilizer*

In 1933 a comparison of seven methods of fertilizer placement was made in five states with results shown in table 1. In the table will be found essential information pertaining to a description of each fertilizer placement, soil type, analysis of fertilizer, rate of application and variety of potato grown.

### DISCUSSION

In Maine, on Caribou loam, the highest yield, 320 bushels to the acre, resulted from the No. 6 placement, a side-placement, 1 inch on each side of and slightly lower than the seed piece; second highest, No. 4, another side placement, 318 bushels per acre, 2 inches on each side and 2 inches below the level of the seed piece. Third highest yield resulted from No. 7 placement, fertilizer applied in furrow with a light soil covering of  $\frac{1}{2}$  to 1 inch of fertilizer-free soil between seed piece and fertilizer. The acre yield was 314 bushels.

From this point the yields decreased gradually to 298 bushels for the No. 1 placement. The lowest yield, 280 bushels per acre, came from applying the fertilizer in the furrow, mixed with the soil. The reduction in this case, comparing No. 1 and No. 2 placements, was 18 bushels. Considering the highest placement, 320 bushels, and the lowest, 280 bushels; a difference of 40 bushels is obtained in favor of the No. 6 side placement method.

An average of the three below the seed piece placements, No's. 1, 2 and 7, gives 297 bushels; that of the four side placements, No's. 3, 4, 5 and 6, gives 311 bushels, a difference of 14 bushels, suggesting a trend in favor of side placement.

In Michigan, weather conditions during the growing season were adverse to the best development of the potato crop, which helps to account for the comparatively low yields. The results obtained on Montcalm sandy loam show that highest yields, 162 and 164 bushels per acre, were obtained with the side placement methods, No's. 3 and 5. The lowest yield was 115 bushels with placement No. 2, fertilizer in furrow, well mixed with soil. The difference between high and

TABLE 1.—General yield summary of fertilizer placement experiments with potatoes—1933. Conducted co-operatively in Maine, Michigan, New Jersey, Ohio and Virginia. Comparison of ordinary and double strength potato fertilizer.

No.		Placement of Fertilizer	Potato Yields Obtained on Different Soil Types											
			Maine (Caribou loam)		Michigan (Montcalm sandy loam)		Michigan (Mancelona gravelly sandy loam)		New Jersey (Sassafras loam)		Ohio (Canfield silt loam)		Virginia (Sassafras sandy loam)	
			4-8-7	8-16-14	4-12-8	Bus.	4-12-8	Bus.	4-8-7	8-16-14	4-10-6	6-6-5	12-12-10	Bus.
1		In furrow, in band 4-5" wide, 2" of fertilizer-free soil between seed-piece and fertilizer	298	300	141	122	112	119	216	194	196	190	196	203
2		In furrow, well-mixed with soil	280	303	115	112	112	119	216	194	177	207	203	203
3		2" on each side of seed-piece, same level, in narrow bands 3-4" wide	300	316	162	119	119	119	236	240	211	219	232	232
4		2" on each side of seed piece, 2" below level of seed piece in narrow bands 3-4" wide	318	322	133	121	121	121	254	234	213	203	223	223
5		4" on each side of seed piece, same level, in narrow bands 3-4" wide	307	316	164	118	118	118	231	233	211	200	239	239
6		1" on each side and slightly below level of seed piece, in narrow bands 3-4" wide	320	332	143	118	118	118	244.5	240	209	213	210	210
7		In furrow, in band 4-5" wide, 1" of fertilizer-free soil between seed piece and fertilizer	314	338	126	138	138	138	211	218	179	187	229	229
		Unfertilized	157	...	139	52	52	52	145	...	168	94	...	...
		Range in yield among placements (Bus.)	40	38	49	26	26	26	43	54	36	32	43	43
		Variety grown	Cobbler	Cobbler	R. Russet	R. Russet	R. Russet	R. Russet	Cobbler	Cobbler	R. Russet	Cobbler	Cobbler	Cobbler
		Rate of application per acre (Lbs.)	2000	1000	800	800	800	800	2000	1000	1500	2000	1000	1000
		Average, all placements (Bus.)	305	318	140.5	121.1	121.1	121.1	232	226.6	199.4	202.7	218.8	218.8
		Increase due to fertilizer (Bus.)	148	161	0.5	69.1	69.1	69.1	87	81.6	31.4	108.7	124.8	124.8

low placement yields was 49 bushels per acre. An average of the three under the seed piece placements, No's. 1, 2 and 7, gives 127 bushels; of the four side placements, about 151 bushels, a difference of 24 bushels in favor of side placement. Yields without fertilizer were comparatively high, perhaps in some measure associated with weather conditions, which may have tended to lower the efficiency of the added fertilizer.

One of the most interesting points connected with the 1933 studies is connected with the placement experiment on Montcalm sandy loam. Considering that the difference in yield between the unfertilized (139 bushels per acre) and the seven fertilizer placement methods varied from 24 bushels below to 25 above, it would seem that the method of placement is important. Apparently, if a grower, on the basis of the 1933 results, had employed the No. 2 method, he would have had a yield 24 bushels below the unfertilized. On the other hand, the No. 3 or No. 5 side placement methods would have returned the grower an average yield of 163 bushels, 24 above the unfertilized.

In Michigan, on Mancelona gravelly sandy loam, while the actual yields were low, the response to fertilizer was comparatively marked as will be noted in table 1. Placement No. 7, which gave the highest yield, 138 bushels per acre, is where the fertilizer was applied below the seed piece in a band with a narrow zone of fertilizer free soil intervening. The range between highest and lowest placement yields was 26 bushels per acre.

In New Jersey, on Sassafras loam, highest yields, (average of 249 bushels) were obtained with placements 4 and 6, both side placements; and lowest yields with two below the seed piece placements, No's. 2 and 7, averaging 213.5 bushels, a difference of 35.5 bushels per acre. The difference in yield between the highest yielding placement and the lowest was 43 bushels per acre. It was found impracticable to include the No. 1 placement in the New Jersey test on account of a heavy crop of green rye which caused too much draft on the planter and irregularity of fertilizer placement.

Response to fertilizer on the Sassafras loam in New Jersey proved good, the unfertilized land producing at the rate of 145 bushels per acre, whereas some fertilizer placements gave 100 bushels increased yield. The difference between the average of all placements, 232 bushels, and the unfertilized, 145 bushels, is 87 bushels, a distinctly marked response to fertilizer.

In Ohio, on Canfield silt loam, the four highest yielding place-

ments were No's. 3, 4, 5 and 6, all side placements, the average being 211 bushels per acre. The underneath placements, No's. 1, 2 and 7, produced an average yield of 184 bushels per acre, a difference of 27 bushels. The range between the highest and lowest yields for the seven placement methods was 36 bushels per acre. Relative to response to fertilizer, the unfertilized soil gave a yield of 168 bushels, while the average yield for all the fertilizer placements was 199 bushels, an average difference of 31 bushels in favor of fertilizer treatment. The greatest increase due to fertilizer was 45 bushels, resulting from No. 4 method, a side placement.

In Virginia, on Sassafras sandy loam, two side placements, No's. 3 and 6, proved superior. It will be noted, however, that certain side placements, No's. 4 and 5, failed to do as well. There is a probability that in the case of the 4 inch to the side placement, the fertilizer may have been too far away to have been as effective as noted with close to the seed placements, e. g., No's. 3 and 6. The range in yield among the different placements for the highest and lowest yields proved to be 32 bushels. The average yield of the three underneath placements, No's. 1, 2 and 7, is 195 bushels; of the four side placements, No's. 3, 4, 5 and 6, approximately 209 bushels. Response to fertilizer, under conditions prevailing in Virginia in 1933, was exceptionally well marked. Unfertilized plots gave an average yield at the rate of 94 bushels per acre, indicating strikingly the effect of plant food mixtures. The average yield for the seven placement methods is 202 bushels, 108 bushels higher than the unfertilized.

#### *Studies With Double-Strength Fertilizer*

The results of fertilizer placement studies in Maine, New Jersey and Virginia, with double strength fertilizer mixtures, are also given in table 1.

In Maine, the average yield of the 4-8-7 mixture, an average of all placement methods, is 305 bushels; of the 8-16-14 mixture, 318 bushels per acre. In New Jersey, the ordinary strength mixture based on a similar average, gave a slightly higher yield than the double strength mixture. In Virginia, it will be noted that the double strength mixture gave a higher average yield by 16.1 bushels per acre than the ordinary strength.

In Maine the maximum range in yield of the different placements is practically the same, 40 and 38 bushels, respectively, for the 4-8-7



and 10-16-14 mixtures. The average yield of the three below the seed piece placements, No's. 1, 2 and 7, was 314 bushels per acre for the 10-16-14 fertilizer; for the four side placements, 321.5 bushels. The difference, 7.5 bushels per acre, is not marked.

In New Jersey, this latter trend was distinctly true of the 10-16-14 mixture, the two underneath placements, No's. 2 and 7, giving an average of 206 bushels per acre; the four side placements, an average yield of 237 bushels, a difference of 31 bushels in favor of side placements. The No. 7 placement, however, gave the highest yield.

In Virginia, the double strength, 12-12-10 mixture, proved better than the ordinary strength fertilizer, averaging for all placements 16.1 bushels per acre higher yield. The two placements which gave highest yields with the 12-12-10 mixtures were No's. 3 and 5, respectively, which represent placements 2 and 4 inches on each side and on a level with the seed piece. The placement method giving third highest yield was No. 7, where the fertilizer was below the seed piece with a thin layer,  $\frac{1}{2}$  to 1 inch, of soil interposed.

Summing up the results as a whole, for both the single and the double strength mixtures, it is reasonably evident that, with an occasional exception, the side placement of fertilizer for potatoes again proved superior to underneath placement. This was also the case in 1931 and 1932.

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## REVIEW OF LITERATURE

**Influence of day length on potato tuberization.** SURZHINA, MARY (*Transactions of the Potato Scientific Research Institute U. S. S. R. Part 1, Pp. 45-71, 1933*).—The experiments were conducted on a sandy soil and the varieties used were Epicure, Centenary, Maercker and Wohltmann. The main factor studied during the three years 1930 to 1932 was the influence of a 10-hour day to which the plants were subjected from time of emergence until completion of growth. In addition, the experiments in 1930 and 1931 included a group of plants, which received 20 ten-hour days during the flowering period. Abbreviation of the days was accomplished by use of movable boxes which covered from 10 to 15 plants.

The following conclusions were drawn from the 10-hour day-light plants data:

Flowering of plants was depressed, in fact, was for the most part absent. Flower stems and buds were greatly reduced.

Growth of plants was reduced and ripening accelerated. Color of tubers was changed.

Tuber formation was more rapid during the early stage of growth as compared with checks, and was markedly less in the later stage of development.

The ratio of tuber weight to that of the vines (plants) was greater in the short day plants.

The tuber starch content was lower in the short day plants.

The twenty 10-hour day treated plants showed a marked inhibition in rate of flowering but without eliminating it completely or causing any delay in its beginning.

Changes in habit of growth of plants and in tuber color were less marked than in those grown under a continuous 10-hour day.

The short day treatment during the middle of the vegetative period did not depress vine growth nor induce premature ripening so markedly as in the continuous short illumination plants. Similarly, the ratio of tuber weight to that of the vines was not affected, nor was the starch content of the tubers materially lessened.—WM. STUART.

**Carolus, R. L.** Some factors affecting the absorption of magnesium by the potato plant. *Amer. Soc. Hort. Sci.* 30 (1933): pp. 480-484.—Results of a greenhouse pot experiment comparing the effects on yield and plant characters of different carriers of magnesium applied to soils of high and low acidity and of high and low organic matter content are reported. Magnesium deficiency was most marked on plants grown in a soil of high acidity (pH 4.3) in spite of the fact that this soil was well supplied with organic matter. Soil testing pH 5.75 and low in O.M. yielded 45 barrels per acre compared to 30 barrels per acre for the soil testing pH 4.3 and high in O.M. However, the author concludes that the effectiveness of treatments with either nitrogen or magnesium was affected most by the ability of the soil to prevent leaching of these elements. Hydrated calcium lime was compared with hydrated dolomitic lime. The calcium lime was not effective in making magnesium available to the plant even though it reduced soil acidity. Magnesium deficiency was evident by a brittleness and a brown mottling of the lower leaves.

On soils testing pH 5.0 or below where yields are declining due to a deficiency trouble, sufficient dolomitic lime to bring the reaction up to 5.2 or 5.3 is recommended. Where the reaction is already high enough, this deficiency can be remedied by applying

magnesium sulfate or sulfate of potash-magnesia sufficient to add 20 to 30 pounds of MgO to the acre.—E. V. HARDENBURG.

**Ware, L. M. and Kimbrough, W. D. Influence of different fertilizer treatments on certain characteristics of the Irish potato.** *Amer. Soc. Hort. Sci.* 30 (1933): pp. 485-490.—The standard fertilizer treatment used in these experiments, conducted 1927-1932 was 1,350 pounds per acre of a 3-6-4 mixture. For comparison the quantity was varied from none to one-half, normal, double, and treble the standard rate. Yields increased significantly up to the treble rate where a decrease was noted. As the rate of application increased up to the treble rate, there was a corresponding decrease in percentage of total solids, starches, sugars, and loss of weight in storage. For the treble rate, there was an increase in storage shrinkage and a halt in the downward trend in percentage of total solids and starches.

A comparison of sources in nitrogen between nitrate of soda, sulphate of ammonia, and cottonseed meal gave highest yields for nitrate of soda and lowest for cottonseed meal. No differences in yield, storage loss, total solids, or starches were found between muriate of potash and sulphate of potash.—E. V. HARDENBURG.

**Vincent, Chester L. and Pawson, Walter W. Factors affecting potato seed piece decay.** *Amer. Soc. Hort. Sci.* 30 (1933): pp. 491-495.—This paper deals with the value of suberized seed pieces for planting in warm soil and the relation of condition of tubers to decay. It also discusses the relation of seed-piece decay to soil moisture, the use of dust materials and methods of handling cut seed. Experiments were made in the greenhouse and in the field in the Spokane Valley of Washington during 1932 and 1933. One and one-fourth ounce seed pieces of three varieties were used. Comparisons were made as follows: (1) seed cut in advance of planting and stored at 60°-70° F. in a relative humidity of 30-40 per cent; (2) cut in advance and stored at 60°-70° F. in a relative humidity of 85 per cent; and (3) cut the same day as planted. All seed pieces were dug up for examination as soon as the plants showed above the ground. Results were as follows: (1) germination of freshly cut seed planted in warm soil is in direct proportion to the firmness of the tubers when cut; (2) suberization of cut seed is an advantage in preventing seed piece decay when planting in warm soil except where firm unsprouted seed is used. There was less seed-piece decay when sets were planted in cool than in warm soil. This was especially noted when seed suberized at

low humidity was used. There was some indication that seed-piece decay was greater in soils excessively moist than in those of normal moisture content regardless of soil temperature.

Siccatives for drying freshly cut seed including sulfur, lime and gypsum were compared when applied to both firm and shriveled seed. One lot of each treatment was planted at once; another lot after suberizing for 7 days in humid air. There was very little decay in any lot when planted in cool soil (50° F.). When planted in warm soil (73° F.) these drying materials did not decrease seed-piece decay. Instead decay was increased, sulfur being especially injurious.—E. V. HARDENBURG.

## SECTIONAL NOTES

### COLORADO

The potato harvest has been about 75 per cent completed at this time. Yields and quality are considerably below expectations. The psyllid damage was practically universal over the entire state.

Growers of Russet Burbanks were particularly disappointed in yields and quality in the Eagle Valley and Carbondale districts. This variety showed the effects of psyllid damage in the tubers more than any of the others. Many of the tubers produced small knobs from all of the eyes. Others produced long, crooked necks at the stem ends and resembled crook-necked summer squash more than potatoes. There are few U. S. No. 1's in the main Burbank district. The only No. 1's, in fact, are being produced in fields which were killed by frost the 2d of September. Yields, of course, in these cases are quite low. In fields that were not killed by frost until the latter part of September, it is very doubtful whether these can be made to grade even U. S. No. 2.

The quality of other varieties was not nearly so much affected by the psyllids and although yields are low, the percentage of No. 1 stock will only be slightly lower than normal.

The certified seed crop has suffered materially during the summer, and there have been more rejections because of fusarium than in any season since certification started in Colorado in 1917.

Spindle tuber was also somewhat more prevalent this year than in previous seasons.

Bin inspections will start about the 15th of October, and as soon as these are completed we will know the exact size and quality of the crop. Inquiries for certified seed, so far, have been considerably more numerous than in the past.

The quality of potatoes in the San Luis Valley is practically as good as usual, except that the size will be considerably smaller than normal. With the small size of the crop and the poor quality in some sections, there will be little new along the marketing line. Growers will be obliged to concentrate all their efforts on disposing of it at all.

In meetings held over the state during the past year to obtain the sentiment of growers regarding the regulation of the potato crop, the consensus of opinion seems to favor some type of regulation. In fact, growers were ready this year to sign up a code if the Federal Government had felt it advisable to organize the industry in this state. (October 10).—C. H. METZGER.

## INDIANA

I have just finished two days' work in the potato fields in central and northern Indiana and find that our yields are about as expected—that the fall weather has increased the potatoes per acre to a considerable extent and it looks as if the Indiana crop this year would go about 4,000,000 bushels, which is still considerably short of the consumption. The yields are running from 200 to 275 bushels of No. 1's per acre in the better fields under ordinary conditions, while in the better sections the top yield so far reported is 535 bushels. We have had no frost as yet; in many cases the vines are still green. I presume that our big potato harvest will start next week and continue until perhaps the first of December for southern Indiana. We have no blight to speak of in our state, and little damage from the leaf hopper; yet we find the sprayed or dusted plots are running higher than those which have received just ordinary care.

Our growers are complaining a little about the price as potatoes are selling about \$1.00 a hundred at the farm and in most cases the buyer furnishes the sack. I look for the price to get lower although we have an excellent market in our state but find a lot of poor stuff being shipped in from other localities. (October 10).—W. B. WARD.

## MAINE

I left Aroostook County Friday afternoon, October 12th, at which time there were about nine inches of snow on the ground and about ten per cent of the crop yet to be dug. We have shipped four cars of certified seed and the inspectors are working two loading stations going into the Presque Isle district. According to the Government inspector in the Boston market the quality is above the average. The average yield for the State is estimated to be 315 bu. per acre. Next month I hope to have the figures ready for the yield on the certified fields.

Prices being offered are most discouraging, and we believe will have a tendency to cause a let-down in the interest that has been shown in certified seed work. This is a tremendous mistake. Buyers should purchase certified seed and pay a reasonable differential. (October 15).—E. L. NEWDICK.

#### MARYLAND

Field inspections for potato seed certification on the Eastern Shore of Maryland were completed in September.

The acreage of late potatoes eligible for certification on the Eastern Shore was very much larger in 1934 than it was last year, 432 acres compared with 197 acres in 1933. This acreage consisted chiefly of Irish Cobblers. The only other varieties eligible for certification were 12.75 acres of Dakota Reds (Jersey Redskins) and 0.25 acres of McCormicks. Most of the fields were practically free from disease and mixtures although a few fields were disqualified on account of the presence of Mosaic, Leaf Roll or mixtures. Yields are expected to be approximately 25% below average on account of the excessive rainfall during September. (October 16).—R. A. JEHLE.

#### MASSACHUSETTS

Harvesting of the potato crop consisting entirely of table stock is practically completed in Massachusetts on 16,000 acres yielding around 2,300,000 bushels according to preliminary estimates. September, with 8 to 10 inches rainfall but no frosts afforded ample growing season for well sprayed vines surviving midseason insects and dry weather to reach full maturity and good yields—the highest recorded to date in the 300 bushel club being 587 bushels on a measured acre. Early ravages by flea beetles, some injury by leafhoppers and a heavy infestation of aphids checked yields materially on many fields. Instances of rotting while only spotted over the state, nevertheless have caused loss on wet land.

While farmers are dissatisfied with the continued low market prices, no feeling yet seems generally apparent among them for government control. (October 15).—RALPH W. DONALDSON.

#### MINNESOTA

At this date, potato harvesting in Minnesota is practically completed. From a number of observations recently made in the Red River Valley section, the yields vary from 25 to 175 bushels per acre. Since the growing season was, in general, very dry, the differences in yield are due to a large extent to local showers occurring at opportune times



in those localities where the yields are the largest. Not only was the growing season dry, but several early frosts in the latter part of August and early in September contributed somewhat in cutting down yields. This is true for the entire state. The average yield in the Red River Valley section probably will not exceed 65 bushels per acre. On the peat bogs the average yield will be in the neighborhood of 150 to 200 bushels per acre, which is considerably less than what it would be under more favorable conditions. In the Arrowhead section, conditions were somewhat better than in the other potato-producing areas, although they were far from ideal for the production of heavy yields.

The result of these conditions means that the quality of the crop will range from fair to very good.

Following is a summary of the acreage of certified seed potatoes produced in 1934:

<i>Variety</i>	<i>Acreage</i>
Bliss Triumph .....	1224.45
Irish Cobbler .....	3023.97
Early Ohio .....	1045.58
Warba .....	51.90
White Gold .....	23.00
Green Mountain .....	45.75
Russel Burbank .....	55.70
Rural New Yorker .....	13.00
Katahdin .....	22.25
Spaulding Rose .....	44.25
Chippewa .....	3.00
Total acreage certified, 5552.85	

This is a considerable increase over the acreage certified in 1933, but yield reports being received from the certified seed growers indicate a considerably smaller yield than that obtained last year. (October 12).—A. G. TOLAAS.

#### NEBRASKA

On the night of September 14th we had a killing frost in western Nebraska which stopped growth on practically all potatoes. The rain which had been hoped for after the middle of August did not materialize in amounts more than adequate to just barely maintain life in the plants. Consequently what looked like a reasonably good crop prospect in the middle of August turned out to be the worst in recent years. In some of the dry land areas the crop is considered more

nearly a failure than can be recalled by people who have been in that country for more than 25 years. A number of fields of potatoes have not been dug. In many other instances the farmers think that they will have only enough to plant their own acreage next spring. Consequently the amount of seed which will be available for sale outside of the state, especially from the dry land areas, will be very much less than usual. The irrigated crop is short because of the shortage of water. The quality of potatoes produced in western Nebraska is, however, unusually good, there being practically no second growth and no scab. (October 8).—H. O. WERNER.

## NEW YORK

Western New York is harvesting an average, maybe better than average, crop so far as bushel yield is concerned. Prices are down as low as 12 to 18 cents per bushel in some sections. Truckers are paying 20 to 30; perhaps 35 cents would be top right now. The unusually long growing period beyond September 15th is primarily responsible, for the Rural-type potato grows very fast at the end of the season. Some fields were not killed by frost until October 14th.

In spite of the large crop and low prices, nearly every man with whom I talked was against any governmental action. The usual response was, "Well, what has the government done for the eastern farmer so far with their various schemes to help the midwestern farmer except to raise prices of feed and meat products that we have to buy." That seems to be quite the common reaction. There are a few who feel that perhaps the government has not had sufficient time to demonstrate the advantages that might accrue through their efforts of the past year and a half to help the farmer. (October 17).—J. R. LIVERMORE.

## NEW JERSEY

The harvesting of the New Jersey crop is about completed but it is estimated that approximately 300 cars remain to be sold. The Central Sales office has been closed for two weeks and all sales are now being made by the dealers from their own offices. It is probably unnecessary to state that prices have not been maintained so well by this arrangement as they were when sales were made from a central office.

The late crop is now being harvested. Late blight was severe in some fields, resulting in the early death of the vines. It should be pointed out, however, that where a 5-5-50 Bordeaux mixture was properly applied, little or no trouble was experienced with blight. (October 16).—WILLIAM H. MARTIN.

## NORTH CAROLINA

On September 20 about a thousand potato growers from Virginia, North Carolina and South Carolina met at Washington, North Carolina and adopted the following program. It is planned to push the program as much as possible to get what legislation they can in regard to the control of the potato acreage. It is hoped that a plan similar to the one under which the tobacco growers operate will be placed in operation. The following resolutions were adopted at the Washington, North Carolina meetings:

1. That the federal and state legislative representatives be requested to secure the inclusion of potatoes as a basic commodity.
2. That legislation be passed controlling share planting.
3. That the present marketing agreement be accepted, with modification if possible, until potatoes are made a basic commodity.
4. That the Consumers Council of the A.A.A. be requested to investigate the prices of fertilizer and packages with a view to calling a re-hearing on the N.R.A. fertilizer code, at the place where the fertilizer is consumed, and to make an investigation generally into the potato marketing situation, including particularly the crop operations of fertilizer companies through themselves, their agents, subsidiaries, acceptance corporations or other subterfuges, and their acts in promotion of sales of fertilizer through agreements which inevitably insure over-production and a plentiful supply of cheap potatoes for the benefit of chain stores and other subsidiaries. (October 12).—ROBERT SCHMIDT.

## OHIO

The potato crop has been improved by fall rains and cool weather. Production is now estimated slightly below the five-year average of ten and one-half million bushels. The greater portion of the late crop of potatoes is grown in northeastern Ohio and this section has been favored more than the rest of the state with fall rains. Western and central Ohio remain dry, but cool weather has improved the crop even in these sections.

Spotty stands, especially in northeastern Ohio, and favorable grow-

ing fall weather, will be responsible for many large tubers, many of which show growth cracks and hollow heart; otherwise, the quality is good. The late fall weather is keeping the vines green and digging is being delayed.

Growers in Ohio are again attempting to prevent price cutting during the marketing season. Representatives from ten counties in northeastern Ohio met recently at Ravenna. An invitation was extended to western Pennsylvania Counties to attend the meeting. Three of them responded. As a result of this meeting, eight Ohio counties have organized Potato Associations. They in turn have appointed a price committee. These Committees will prepare market letters to be mailed to the growers in the county. Three western Pennsylvania counties have joined in this movement. Detailed market information will be gathered by the Bureau of Markets and this material rushed to the county officers. In addition the material will be broadcast over two radio stations. It is generally felt that if growers in the county are kept informed on potato prices, price cutting will be prevented. Last year similar efforts were made and all felt that it helped to keep the price of potatoes uniform in this state. It is expected that additional counties will join in this movement.

Columbia and Mahoning counties have formed a cooperative grading and marketing group and it will furnish storage and selling service for growers. Two grading stations will be set up in these counties. This is an experimental project in cooperation with the Ohio Farm Bureau and it is hoped that the cost of such operations will be well established this marketing season and that this information will be available in other counties for the next year.

A Growers' and Buyers' Potato and Apple Show is to be held at the Northern Ohio Food Terminal, Cleveland, Ohio, November 8th and 9th. Commercial packages containing representative samples of the produce for sale will be exhibited. Buyers from the territory reached by the Food Terminal will see these exhibits. This show will give the buyers and growers an opportunity to contact each other. There will be a speaking program. Members of the trade will explain the various methods of selling at the Terminal Market.

More than 2,000 potato growers attended the State Potato Day held at the Harvey S. Firestone Farm in Columbiana County in September. In addition to all types of potato machinery and equipment demonstrations, there was a speaking program on "Water Conservation" and building of small dams. The marketing program was also explained to the growers.—(October 15).—E. B. TUSSING.

## PENNSYLVANIA

According to the October 1st estimate, Pennsylvania has an average yield of 145 bushels of potatoes per acre. The highest previous yield was 139 bushels in 1928. It is quite possible that the final average for this year will be lower than the present estimate. Many of the good growers have excellent crops, several have already reported over 500 bushels, but many have had their yields reduced below normal by periods of severe drought. Unsprayed fields generally died early in the August dry spell and are yielding poorly. Tops in Somerset County were killed by aphids in late September. In Cambria County, adjoining Somerset, blight developed the following week. Killing frosts did not occur in the northern and mountain counties until October, giving late planted fields a fine chance to grow following abundant early September rains. Where the set was light, due to drought, the size is now quite large. Some fields have a great deal of second growth. Digging has been somewhat delayed by September rains, but is now progressing rapidly. (October 15).—J. B. R. DICKEY.

## VERMONT

Late growth, continuing through the entire month of September, has made some unusually heavy yields among certified seed growers in Vermont. Computations running as high as 622 bushels per acre have been officially reported in connection with the "400 Bushel Club". This record was for Gebbie & Hill of Greensboro. It was computed in an acre selected in their 35 acre field of Green Mountains, and the potatoes were dug in hundred foot sections of row at five different places in the acre, as a basis for the computation. Ten other official reports of over 500-bushel-to-the-acre yields have been received.

There seems to have been little interest from buyers in the purchase of seed this fall, and very few sales have been reported to date.

An effort is being made by the Seed Potato Certification Service and the Division of Markets of the Vermont Department of Agriculture to secure more regular and more comprehensive quotations on certified seed potatoes. The assistance of marketing agencies in other states is being enlisted, and, in some cases, it is hoped to obtain sales data from brokers and individual growers and dealers. (October 15).—HAROLD L. BAILEY.

## VIRGINIA

The 1934 potato season is largely history on the Eastern Shore of Virginia. However, the outcome of the season left a legacy of debt and uncertainty in the minds of the potato producers.

The white potato farmer here and elsewhere has largely thought of his business in terms of chance profit or unavoidable losses sustained through his partnership in an industry over which he feels he has no control, and in which he feels he is more or less exploited by other agencies.

Rarely has the farmer felt that he could assume any direct responsibility for the conditions which lead to profit or loss in his business. Perhaps, this state of mind is responsible for his effort to profit by operating in opposition to the recommendation made for the members of his industry. Unfortunately, the majority react alike to the same stimulus, consequently, the majority in times of stress follow the wrong procedure.

The individual potato farmer has an automatic partnership with other potato farmers. This mutual interdependence cannot be cancelled, even though the farmer has not accepted that fact or what it means industrially. He has not assumed the obligations of partnership, nor have he and his partners developed operating plans to make their partnership profitable. Can partnership profit on this basis?

The potato industry might be likened to a Democratic people, trying to live without benefit of self-government, therefore, without any means of regulating themselves and their industries for the good of all. It would be foolish to say that ungoverned citizens would lose their independence if they approve and abide by laws which give desired rights and protection of these rights equally to all. Likewise, it would not lessen but would enhance the independence of the individual potato growers, if they could set up a method of self-government which would determine the rights of the individual potato grower and protect those rights. Who else is interested in doing this?

Such a unity of purpose should become the goal of the potato farmer. If this unity of purpose could be developed, it would soon place control of production and control of distribution in the hands of the producers.

The control measures attempted by the potato producers in the past have largely been centered on efforts to prevent price cutting through control of the shippers. Desirable as the efforts may be it has been futile in a large way. It did not reach the fundamental need, namely, a control developed by the individuals within the industry and imposed first upon themselves for their own good and for the welfare of the entire industry.

The mental attitude of the Virginia growers makes the ground fallow for some development. There is diversity of opinion as to what should be attempted. Some express dissatisfaction with the work of



the Early Potato Association, many feeling that its recommendations are good but that they must have mandatory authority and restrict the individual farmer.

Many feel the potato should be made a basic commodity, with the thought that the potato industry would receive similar benefits to those enjoyed by the cotton, tobacco, corn and hog farmers, etc. Many farmers may not realize that the potato does not lend itself (under the provision of the Act) to benefits derived in the same way as other basic commodities; nor, that as a consequence, the bill amending the Act would have to provide means of benefits to place potatoes on a plane with other basic commodities. Whether such provisions could be set up and whether the industry as a whole would approve the provisions would have to be determined. Again, it would appear that if found desirable, such an amendment could not be secured to be of service in 1935.

Other farmers believe that the marketing agreement plan, as proposed under the Agricultural Adjustment Act for such commodities as potatoes, will serve the purpose of stabilizing the industry at a profitable figure to the farmer. The method of making shipping prorations to the individual farmer raises doubts of equity in the minds of many farmers, but they feel the marketing agreement is the only possible approach to control that can be brought into use the coming year. For that reason, if no other, the Eastern Shore of Virginia and their leaders are largely favorable to 100% support of the marketing agreement in 1935, thereby giving it an opportunity to prove its worth. Meanwhile, other methods may be brought under consideration.

The general trend of thought on the Eastern Shore of Virginia, and likewise farther South, inclines toward grower control of whatever means are set up to better the potato situation. (October 13).  
G. S. RALSTON.

#### WASHINGTON

There was a move toward the adoption of a state potato code for the marketing of late potatoes in Washington but owing to the crop prospects in the Northwest, organization of the code was finally dropped. As we now stand, our certified seed potato production in Washington will be approximately 25 per cent less than last year even though our acreage is somewhat larger. We have had considerable late blight infection in both our seed and commercial fields west of the Cascade Mountains in Washington, which, in addition to cutting down the crop, at digging time, will undoubtedly decrease the available supply due to decay in storage during the storage season. (October 13).—  
CHAS. D. GAINES.

## WISCONSIN

Potato harvesting in Wisconsin is on in full swing. Favorable weather for harvesting prevails at this date. Harvesting has been delayed as the usual frosts have not occurred and vines are partially green in many potato growing areas. It will require fully ten more days to harvest the late main crop.

The Wisconsin Potato Growers' Association held its Annual Potato Field Day at Rice Lake on Friday, September 28th.

Unusual interest was shown in the trial plantings of the Katahdin variety supplemented by exhibits from all important potato growing sections of the state. At the Spooner Branch Station the Katahdin has shown unusual promise as grown under the severe seasons of 1932, 1933 and 1934. The Katahdin has proven very stable as to type, shape, quality and yield. On a 1 and  $\frac{1}{3}$  acre plot located on medium to light sandy loam at the Spooner Branch Station the yield was 330 crates. The season from July 20th to August 20th was unusually hot and dry. The Katahdin appeared to be comparatively free from certain virous maladies and stem rots that usually attack the Rural New Yorker group during dry hot seasons.

The Chippewa variety is also showing promise in several sections of Wisconsin. (October 11).—J. G. MILWARD.

## CANADA

Approximately 20,975 acres passed field inspection this season in Canada, compared with 18,600 acres passed in 1933. Following are the particulars of varieties, acres listed for inspection, and acres passed in 1934:

	<i>Entered</i>	<i>Passed</i>
Irish Cobbler .....	14,080 acres	11,980 acres
Green Mountain .....	10,848	6,029
Bliss Triumph .....	1,093	1,053
Rural New Yorker ....	1,321	1,031
Netted Gem .....	438	365
Early Ohio .....	301	227
Other Varieties .....	444	290
	<hr/> 28,525 acres	<hr/> 20,975 acres

In the Maritime Provinces, the yields are good and the crop is of excellent quality, better even than last year. Practically no Late

Blight anywhere. Seasonal conditions were favorable to the development of Wilt in Quebec and Manitoba and this disease has been more in evidence than ever before. The crop in Ontario is good, with yields better than the average growing conditions in the district appeared to indicate. The yields throughout the West, except for British Columbia, are light due to drought and summer frosts.

The prospective demand for seed is not so brisk as usual at this season, although actually 182 cars have been exported by water to this date, as compared with 18 last season. The export demand for table stock is slow and an effort is being made to secure new markets. The crop is comparatively light this season in Holland and Germany and their exports to Egypt will be below normal. There is a possibility that Egypt may take some of the surplus table stock from the Maritimes this season and sample shipments have already been made. There is little demand for table stock for Cuba, so far this season.

Prices are somewhat lower than usual at this season, but many look for somewhat higher prices as the season advances and stock becomes more widely distributed. (October 13).—JOHN TUCKER.

### THE PRICE SITUATION

The following report was released on October 16 by the Bureau of Agricultural Economics of the United States Department of Agriculture: The potato crop made rapid improvement in the Central and Northeastern States during September and market prices declined. The price declines were most pronounced in the Central States, where the tendency was to eliminate the spread between Chicago and New York. For several months Chicago prices have averaged above New York because of the scarcity of intermediate potatoes in the Chicago territory and the abundance of potatoes in the New York area. Now that both markets are drawing their supplies from the late states, it is likely that the price relationship between the two markets will be more normal. In view of the large supplies of late potatoes, it is likely that potato prices will remain at or near the present low levels during most of the 1934-35 season.

Unusually good growing weather and the absence of frost, brought about a sizeable improvement in the potato crop prospect in all of the Northern Late States except in the Rocky Mountain area. Therefore, production in the 30 late states is now forecast at 290,000,000 bushels or 28,300,000 bushels larger than the small crop of 1933, but close to the recent 5-year average. The October 1 forecast for the 3 North-

eastern Surplus Late States is 110,690,000 bushels, or 26 per cent larger than in 1933 and 21 per cent above average; for the 5 Central Surplus States, 88,956,000 bushels, or 24 per cent larger than in 1933 but only slightly above average; for the 10 Western Surplus States, 56,320,000 bushels or about 22 per cent less than last year and 24 per cent below average; and for the 12 other Late states, 34,040,000 bushels, or 16 per cent greater than a year ago but 8 per cent below average. The total United States crop including the early and intermediate states is now estimated at 362,391,000 bushels compared with 320,353,000 in 1933 and 365,556,000 bushels, the 1927-1931 average.

Potato prices at market centers declined during September, particularly in the middle-western cities where there was an adjustment of prices in these markets to a more comparable level with those in the eastern cities. Prices of United States No. 1 potatoes at New York averaged 92 cents per 100 pounds in the first week of October compared with 96 cents a month earlier and \$1.94 a year ago. At Chicago United States No. 1 round whites averaged 98 cents per 100 pounds against \$1.34 a month ago and \$1.29 last year.

Potato prices at most of the important shipping points showed seasonal declines during September with the general levels much below those of a year ago. At Presque Isle, Maine, Green Mountains were quoted at from 45 to 50 cents per 100 pound sack during the first week of October whereas they averaged \$1.25 per 100 pound sack a year ago. The Maine crop is expected to be at a record height this year and it is reported that, due to the delay in shipments, this season, there will not be enough storage space to take care of the entire merchantable portion of the crop. At Waupaca, Wisconsin, f.o.b. prices averaged 70 cents per 100 pound sack for the first week of October compared with about \$1.00 a year earlier. F.o.b. prices at Idaho Falls, Idaho, averaged 72 cents per 100 pound sack against 79 cents a year ago. The United States farm price of potatoes averaged 62.8 cents per bushel on September 15, compared with 68.0 cents on August 15, 100.8 cents on September 15, 1933, and 74.8 cents the September average from 1910-1914.

Car-lot shipments of potatoes totaled 4,800 cars in the week ended October 6, compared with 3,476 the previous week and 5,673 cars a year ago. Owing to the large supply of potatoes produced in the Intermediate States near the market centers, shipments from the late surplus states have been at a slower rate than last year. To October 6 only 25,784 cars had been shipped compared with 30,216 cars to October 7, 1933.

# Ohio Superspray Hydrated Lime

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F. A. Raymaley—County Agricultural Agent, Bridgeton.

Growers in New Jersey and Pennsylvania Who Have  
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# American Potato Journal

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## PROMPT ACTION NECESSARY

Representatives from the northeastern states met in New York November 8-10 to consider ways and means of improving agriculture in this section. Potato growers from these states met to discuss what steps could be taken to prevent a recurrence of this year's low prices. Some were strongly of the opinion that the potato should be made a basic commodity. Others expressed the belief that this should be done only as a last resort. There was considerable discussion concerning the possibility of effecting a reduction in acreage by restricting credit. The question of a more satisfactory marketing system was likewise discussed as was the advisability of withholding second size and off-grade potatoes in years of crop surpluses.

No definite action was taken on any of these points but it was recommended that a permanent committee be appointed to consist of one representative from Vermont, New Hampshire, Rhode Island, Connecticut and New Jersey; two (2) from Maine, Pennsylvania and New York (one from Long Island and one from Up-State). These men are to be appointed by the potato organization in the different States. An advisory committee, not to exceed two (2) may be appointed by the Extension Director of each State.

A steering committee of six (6) men shall be appointed from the advisory committee by the temporary chairman. The representation on this committee shall be as follows: one each from Pennsylvania, New Jersey, New York and Maine; one from Vermont and New Hampshire; and one from Massachusetts, Connecticut and Rhode Island.

This committee will meet in the near future to consider plans for improving the industry in these states and later will meet with committees from other sections to consider the industry as a whole.

We must make an attempt to formulate a plan which will be acceptable to all sections, difficult as this may be. Another year such as the present will ruin many potato growers. A strong effort should be made to prevent this. A careful study of the situation should be made and action taken soon, since if this is long delayed, it will be too late to accomplish anything for next year.